General

Guideline Title

Endovascular repair of traumatic thoracic aortic injury: clinical practice guidelines of the Society for Vascular Surgery.

Bibliographic Source(s)

Lee WA, Matsumura JS, Mitchell RS, Farber MA, Greenberg RK, Azizzadeh A, Murad MH, Fairman RM. Endovascular repair of traumatic thoracic aortic injury: clinical practice guidelines of the Society for Vascular Surgery. J Vasc Surg. 2011 Jan;53(1):187-92. [22 references] PubMed

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

Definitions of the strength of the recommendations (Grade 1 or 2) and quality of the evidence (Level A–C) are provided at the end of the "Major Recommendations" field.

Recommendation Based on the Meta-analysis

Prospective randomized trials directly comparing open vs endovascular repair of traumatic thoracic aortic injury are unavailable. Despite probable clinical equipoise, such a clinical trial will unlikely be conducted in a timely and successful manner. Therefore, based on the systematic review of the available literature (see the "Availability of Companion Documents" field), the committee suggests that endovascular repair of traumatic thoracic aortic injuries be performed preferentially over open surgical repair or nonoperative management. This recommendation is based on very low quality evidence (Grade 2, Level C).

Evidence

The systematic review commissioned by the Society included 7768 patients (77% males). The mean ages of patients treated nonoperatively and with endovascular or open repair were 39, 39, and 36 years, respectively. The mortality rate was significantly lower in patients who underwent endovascular repair, followed by open repair and nonoperative management (9%, 19%, and 46%, respectively, $P<.01$). The Injury Severity Score (ISS) correlated with mortality after open ($P = .01$) but not endovascular repair ($P = .68$). No significant difference in event rate across the three groups was noted for any stroke. The risk of spinal cord ischemia (SCI) and end-stage renal disease (ESRD) was higher in open repair compared with endovascular repair and nonoperative management (SCI: 9% open vs 3% endovascular and 3% nonoperative, $P = .01$; ESRD:

8% open vs 5% endovascular and 3% nonoperative, $P = .01$). Compared with endovascular repair, open repair was associated with increased risk of graft infection and systemic infections, most commonly pneumonia. With a median follow-up of 2 years, there was a trend toward increased risk of a secondary procedure in endovascular compared with open repair ($P = .07$).

Values

In developing the recommendation that endovascular repair should be performed preferentially over open surgical repair or nonoperative management, the committee placed a significantly higher value on preventing catastrophic complications of thoracic aortic repair (death, stroke, and SCI) and a lower value on potential adverse events such as endoleak, need for reintervention, and device failures. The committee also placed less value on possible late-term outcomes that remain unknown at this time. Furthermore, the committee acknowledges the off-label use of a medical device in the context of endovascular repair of traumatic thoracic aortic injury, although there are ongoing studies investigating the safety and efficacy in this application; however, as the committee believe that preventing death is paramount in this setting, the committee recommends endovascular repair.

Consensus of Opinion on Select Issues

Endovascular repair of traumatic thoracic aortic injuries poses several unresolved or controversial issues whose supporting evidence lacks sufficient clarity in the literature due to cohort heterogeneity, size, and length of follow-up. Nevertheless, the committee sought to arrive at some consensus on a select number of these issues to offer guidance in actual clinical practice. To this end, a series of questions were used to survey the opinions of each committee member. Published evidence is provided in support of the majority and minority opinions when available. Using the GRADE system, all of the following opinions should be regarded as Grade 2, Level C statements.

Issue 1: Timing of Thoracic Endovascular Aortic Repair (TEVAR) in a Stable Patient

The committee suggests urgent (<24 hours) repair barring other serious concomitant nonaortic injuries, or repair immediately after other injuries have been treated, but at the latest prior to hospital discharge. This is consistent with the available evidence in which mortality was 46% in those managed nonoperatively. While most did not favor discharge without repair, depending on the severity of the injury (see below), minority opinion was expressed that expectant management was appropriate with follow-up imaging.

Issue 2: Management of "Minimal Aortic Injury" (Periadventitial Defect or Hematoma)

Intimal or periadventitial defects or hematomas are not infrequently seen on computed tomography (CT) scan. A classification scheme for grading the severity of aortic injury has been proposed: type I (intimal tear), type II (intramural hematoma), type III (pseudoaneurysm), and type IV (rupture) (see figure in the original guideline document). The committee suggests expectant management with serial imaging for type I injuries, while types II to IV should be repaired. This is based on early evidence that most type I injuries heal spontaneously. Decision to intervene and its timing should be guided by progression of the initial radiographic abnormality and/or symptoms.

Issue 3: Choice of Repair in the Young—TEVAR vs Open

There was near unanimity of opinion that anatomic suitability is important for TEVAR but age should not be a factor in deciding the type of repair. The risks of death and SCI are significantly lower in all age groups after endovascular repair compared with open surgery, and these early benefits outweigh the concerns of potential late complications. However, in surgically fit patients with poor anatomy for endovascular repair, conventional open repair should be considered.

Issue 4: Suitability and the Unmet Needs of Current U.S. Food and Drug Administration (FDA)-approved Thoracic Endografts

With the availability of three commercially available devices, there was considerable divergence of opinion about the "best" device for use in traumatic thoracic aortic injury. There was a consensus, however, that arch conformation represented the single greatest unmet need given the curvature of the thoracic aorta at the location of the injury. Inability to conform to this curvature can result in malapposition of the endograft, which can lead to endoleak and endograft collapse. The aortic diameters are relatively smaller in the younger subset of trauma patients. Currently, available thoracic endograft sizes mostly reflect the larger aortic diameters that would be typically encountered in an older cohort with degenerative aneurysms. Excessive oversizing may result in attachment site endoleak, device infolding, endograft collapse, and even death from acute aortic occlusion. Endograft collapse represents a failure of the therapy and a marker of unsuitable anatomy, and open surgical conversion should be considered. No consensus could be reached regarding optimal oversizing for these cases, and opinions were equally divided among minimal to no oversizing, 5% to 10% oversizing, and standard oversizing per manufacturer's recommendations. Historically, abdominal endograft components such as proximal extension cuffs have been used when thoracic devices were either unavailable or anatomically unsuitable. Due to the shorter delivery systems, often these devices could not reach the site of injury from the femoral approach, which necessitated either use of a longer makeshift delivery system or access through a more proximal site. The lengths of extension cuffs are typically short, and this required multiple overlapping pieces. Such an intercalating construction allowed slightly improved conformation to the arch but at the same time introduced multiple

junctions, which were potential sources of type III endoleaks.

A number of next generation devices are presently undergoing clinical trials that may address some of the unmet needs of this therapy. Cook (Bloomington, Ind) has recently introduced the Pro-Form delivery system that is intended to improve arch conformability, and in the near future the TX2 LP (low-profile), which will decrease the profile of the delivery catheter and broaden the range of available diameters. Medtronic (Santa Rosa, Calif) will introduce the Valiant thoracic endograft with the Captivia delivery system, which should enhance the stability and reliability of the deployment mechanism. W. L. Gore (Flagstaff, Ariz) is currently conducting clinical trials of their c (conformable)-TAG device, with which preliminary experience outside the United States appears to show improved arch conformability and greater tolerance to device oversizing.

Issue 5: Left Subclavian Artery (LSA) Management during Zone 2 Coverage

There was near unanimity of opinion for selective revascularization (either before or after TEVAR) depending on the status of the vertebral anatomy, with a minority opinion favoring routine revascularization. In the current meta-analysis, the LSA was covered in 30% of cases. Preservation of antegrade perfusion on the side of the dominant vertebral artery can specifically decrease the risk of posterior circulation strokes. However, the urgency of the repair and the condition of the victim may preclude preoperative assessment. If the LSA is covered, intraoperative angiography of the right vertebral artery would allow the most expeditious assessment of the adequacy of the posterior circulation. If the right vertebral artery is atretic or hypoplastic with or without an intact Circle of Willis, the decision to revascularize the left subclavian artery must be individualized taking into account the availability of surgical expertise, condition of the patient, and other injuries.

Issue 6: Systemic Heparinization

The safety of systemic heparinization during endovascular repair in a multiply injured patient with a closed head injury or abdominal solid organ injury is a controversial issue. The majority of committee members indicated that they routinely use systemic heparin but at a lower dose than in elective TEVAR. A minority opinion was expressed that heparin may not be necessary as most of these cases can be performed relatively rapidly, and the risk of a thrombotic event is likely small. In the final analysis, the decision must be individualized based on the balance of the perceived risks of bleeding in a particular organ system vs the thromboembolic complications.

Issue 7: Spinal Drainage

Spinal drainage has been the mainstay of management for SCI during TEVAR. The issue of prophylactic spinal drainage is controversial even for treatment of degenerative thoracic aneurysms and, to be sure, no data exist for traumatic injuries. SCI is a low-incidence event (3%) after TEVAR for traumatic injuries. Based on this and the proximal location of the injury, limited coverage of the thoracic aorta and the risk of epidural hematoma in a coagulopathic patient, there was unanimity of opinion that spinal drainage is not routinely indicated, and it should only be placed for symptoms of SCI.

Issue 8: Choice of Anesthesia—General vs Regional vs Local

There was a strong consensus favoring general anesthesia. While it is possible to perform TEVAR under local anesthesia (minority opinion), unreliable cooperation of an agitated trauma patient and presence of concomitant injuries that may require additional surgery make this option less favorable.

Issue 9: Femoral Access Technique—Open vs Percutaneous

Nearly all of the committee members favored open femoral exposure in these cases to minimize potentially avoidable complications related to percutaneous closure of large bore access sites. On the other hand, "percutaneous TEVAR" using suture-mediated closure devices can be performed safely with low rates of early and late limb or life threatening events and there was a minority opinion, which favored this approach. In the emergent setting, percutaneous access can also refer to the actual insertion of the endovascular device without initial surgical exposure of the femoral artery. The artery is repaired after the endograft is deployed by surgical exposure, and removal of the delivery system under direct vision. This technique may allow a more rapid endograft delivery and repair in a hemodynamically unstable patient.

Issue 10: Optimal Follow-up Strategy

Given the concerns of cumulative radiation, iodinated contrast exposure, and late endograft collapse, the optimal strategy for long-term follow-up of these patients post-TEVAR remains in evolution. Opinions varied widely within the committee as to the frequency and types of imaging that should be utilized. In the absence of any abnormalities on imaging (i.e., stable endograft position, no endoleak) in the first 12 to 36 months, some have suggested decreasing the frequency to 2 to 5 years, while others have expressed that, lacking any evidence to the contrary, follow-up for traumatic thoracic aortic injuries should be no different than those treated with TEVAR for other pathologies. There was, however, some consensus suggesting that a combination of a multi-view chest x-ray and a magnetic resonance angiography (MRA) may be preferable over conventional contrast computed tomographic angiography (CTA) for long-term imaging, with due consideration of the metallic composition of the

endograft.

Definitions:

Grading of Recommendations Assessment, Development and Evaluation (GRADE) System

Strength of Recommendation	Terminology
Grade 1 (strong)	"The guideline developers recommend..."
Grade 2 (weak)	"The guideline developers suggest..."
Quality of Evidence	Source of Evidence
Level A (high quality)	Well conducted randomized trials
Level B (moderate quality)	Less rigorous or inconsistent randomized trials
Level C (low or very low quality)	Observational studies, case series, and unsystematic observations or expert opinion

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Blunt traumatic thoracic aortic injury

Guideline Category

Assessment of Therapeutic Effectiveness

Management

Treatment

Clinical Specialty

Anesthesiology

Cardiology

Critical Care

Internal Medicine

Pulmonary Medicine

Thoracic Surgery

Intended Users

Advanced Practice Nurses

Hospitals

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

To develop clinical practice guidelines for the management of traumatic thoracic aortic injuries with thoracic endovascular aortic repair (TEVAR)

Target Population

Patients with blunt traumatic thoracic aortic injury

Interventions and Practices Considered

1. Choice of treatment (thoracic endovascular aortic repair [TEVAR] versus open surgical repair versus nonoperative management)
2. Timing of repair (urgent repair)
3. Expectant management with serial imaging for minimal (type I) injuries
4. Type of repair in the young patient (TEVAR versus open)
5. Management of left subclavian artery (selective revascularization of the left subclavian artery)
6. Use of routine systemic heparinization
7. Spinal drainage (not recommended routinely)
8. Choice of anesthesia (general versus regional versus local)
9. Femoral access technique (open versus percutaneous)
10. Optimal follow-up strategy

Major Outcomes Considered

- Death
- Anterior stroke
- Posterior stroke
- Any stroke
- Spinal cord ischemia (SCI)
- End-stage renal disease (ESRD)
- Procedure failure
- Systemic infection
- Graft infection

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse: The committee commissioned a systematic review and meta-analysis from the Knowledge and Encounter Research Unit, Mayo Clinic, Rochester, to evaluate the quality of the evidence in the field and inform the formulation of practice recommendations (see the "Availability of Companion Documents" field).

Eligibility Criteria

Eligible studies enrolled patients with thoracic aortic transection who were treated nonoperatively, via endovascular approach or via open repair. Realizing that the literature will likely consist of surgical case series and noncontrolled observational studies, the reviewers did not limit the eligibility criteria based on study design.

The reviewers included studies that measured the outcomes of interest including death, anterior circulation stroke, posterior circulation stroke, any stroke, spinal cord ischemia, end-stage renal disease, procedural failure (defined as the need for secondary procedure or conversion of endovascular to open repair), and systemic and graft infection. The reviewers defined spinal cord ischemia as permanent decrease or loss of lower extremity neurological function in the immediate postoperative period. Studies were included regardless of their language or duration of patient follow-up. The reviewers excluded nonoriginal references (reviews, letters, etc.) and case series with less than 10 patients.

Study Identification

An expert reference librarian designed and conducted the electronic search strategy with input from study investigators with expertise in conducting systematic reviews. To identify eligible studies, electronic databases (MEDLINE, EMBASE Cochrane, Web of Science, and Scopus) were searched from 1990 through June 2009. The reviewers considered studies published before that date to be less relevant considering the advancements in surgical techniques and perioperative care. Reviewers also sought references from experts, bibliographies of included trials, and the ISI (Institute for Scientific Information) Science Citation Index for publications that cited included studies. MeSH and EMBASE subject headings were primarily used to describe the aorta with subheadings and text words used to describe the surgical procedures. The outcomes of concern were combined with all terms. Detailed search strategy is available in the online Appendix of the systematic review (see the "Availability of Companion Documents" field).

Reviewers working independently and in duplicates screened all titles and abstracts for eligibility. Eligible references were retrieved in full text and reviewed in duplicate. The chance-adjusted inter-reviewer agreement (kappa statistic) about study eligibility ranged from 0.77 to 0.89. Disagreements were resolved by consensus (the two reviewers discussed the study and reached a consensus). When disagreement persisted, a third reviewer adjudicated the reference.

Number of Source Documents

The reviewers found 139 studies that fulfilled the inclusion criteria of this systematic review. Studies consisted of 112 case series (noncomparative) and 27 comparative observational nonrandomized studies. All but eight were retrospective. Figure 1 in the systematic review companion document (see the "Availability of Companion Documents" field) depicts the search and selection procedures.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Grading of Recommendations Assessment, Development and Evaluation (GRADE) System

Quality of Evidence	Source of Evidence
Level A (high quality)	Well conducted randomized trials
Level B (moderate quality)	Less rigorous or inconsistent randomized trials
Level C (low or very low quality)	Observational studies, case series, and unsystematic observations or expert opinion

Methods Used to Analyze the Evidence

Meta-Analysis

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse: The committee commissioned a systematic review and meta-analysis from the Knowledge and Encounter Research Unit, Mayo Clinic, Rochester, to evaluate the quality of the evidence in the field and inform the formulation of practice recommendations (see the "Availability of Companion Documents" field).

Data Collection

Two reviewers working independently used a standardized online data extraction form to extract data from eligible studies. The reviewers extracted descriptive data of included patients (number of patients in each study arm, age, gender, the extent of traumatic injuries, type of surgical procedure, type of graft, percentage of left subclavian coverage, and time between injury and treatment); descriptive data of study characteristics (design, year of publication, and length of follow-up); and outcome data (death, anterior circulation stroke, posterior circulation stroke, any stroke, spinal cord ischemia, end-stage renal disease, procedural failure, and systemic and graft infection).

Statistical Analysis

Meta-analysis

For uncontrolled studies, the reviewers estimated the event rate and the 95% confidence interval (CI) of the outcomes of interest. For controlled studies (comparative studies [i.e., studies in which patients underwent different treatment modalities such as open repair, endovascular repair, or nonoperative management]), the reviewers estimated the relative risk (RR) and the 95% CI. Then, estimates from individual studies were pooled using a random-effects model. The reviewers chose this model a priori anticipating significant heterogeneity. The reviewers used the I^2 statistic, which estimates the percentage of heterogeneity across studies that is due to heterogeneity rather than chance. I^2 values of ≤25%, 50%, and ≥75% represent low, moderate, and high heterogeneity, respectively.

Meta-regression and Subgroup Analysis

Reviewers performed meta-regression using a mixed-effects model to determine whether a linear relationship exists between the a priori established covariates (the independent variables) and the logit event rate of the outcomes of interest (dependent variable). Such associations may have clinical implications and help explain heterogeneity. The covariates and rationale for choosing them were: year of publication (newer studies may have better outcomes due to advancements in medical and surgical care), Injury Severity Score (ISS; patients with worse injuries at presentation are expected to have worse outcomes regardless of procedure), age (older patients may have worse prognosis), lag time between injury and procedure (survival bias), and the percentage of left subclavian artery (LSA) coverage (shown to be associated with increased complications such as arm and vertebrobasilar ischemia). The reviewers also compared in subgroup analysis the effect of early versus late repair on mortality. Statistical analysis was conducted using Comprehensive Meta-Analysis, Version 2 (Biostat Inc., 2005, Englewood, NJ).

Publication Bias

Reviewers visually inspected funnel plots and conducted Egger's regression test to evaluate the impact of publication bias. In this regression model, the reviewers use precision (the inverse of the standard error) to predict the effect size; hence, the size of the treatment effect is captured by the slope of the regression line, and bias is captured by the intercept.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The Society for Vascular Surgery® (SVS) identified several key issues that require the development of clinical practice guidelines to aid surgeons, referring physicians, and patients in the process of decision making. Endovascular repair of traumatic thoracic aortic injuries was one of these

areas. In developing these guidelines, the Society utilized similar processes and formats to their recently published guidelines (see the guideline methodology companion in the "Availability of Companion Documents" field). First, the Society selected a committee of experts in the field who possess knowledge of the clinical aspects as well as patients' values and preferences in this regard. Second, they commissioned the Knowledge and Encounter Research Unit, Mayo Clinic, Rochester, a third party with expertise in evidence-based medicine, knowledge synthesis, and guideline development to conduct a comprehensive systematic review of the literature and identify the best available evidence. The Society acknowledged the value of systematic reviews and meta-analyses since, compared with individual studies, they provide evidence that is more robust and more likely to be applicable to a wider range of patients. Third, the Society utilized the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methods to develop and present their recommendations. The GRADE method provides superior clarity and separates the quality of evidence from the strength of recommendations. It also allows for the inclusion of patients' values and preferences in recommendations.

Consensus of Opinion on Select Issues

Endovascular repair of traumatic thoracic aortic injuries poses several unresolved or controversial issues whose supporting evidence lacks sufficient clarity in the literature due to cohort heterogeneity, size, and length of follow-up. Nevertheless, the committee sought to arrive at some consensus on a select number of these issues to offer guidance in actual clinical practice. To this end, a series of questions were used to survey the opinions of each committee member.

Rating Scheme for the Strength of the Recommendations

Grading of Recommendations Assessment, Development and Evaluation (GRADE) System

Strength of Recommendation	Terminology
Grade 1 (strong)	"The guideline developers recommend..."
Grade 2 (weak)	"The guideline developers suggest..."

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

The Document Oversight Committee of the Society for Vascular Surgery conducts peer reviews of the guidelines documents. This committee consists of a panel of eight experts not involved in any of the aforementioned steps. Committee members who participated in writing the guidelines manuscript are excused from the review process.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for the recommendation and opinions (see the "Major Recommendations" field).

The recommendation and opinions are based on Level C (low or very low quality evidence) (observational studies, case series, unsystematic observations, or expert opinion).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Thoracic endovascular aortic repair (TEVAR) offers the potential for a durable aortic repair while avoiding the morbidity of a thoracotomy, aortic cross clamping, and cardiopulmonary bypass.

Potential Harms

- Stroke, spinal cord ischemia (SCI), and other complications that are associated with open repair can also occur with thoracic endovascular aortic repair (TEVAR). Refer to the "Evidence" and "Values" sections in the "Major Recommendations" field for a comparison of mortality and other complications after open repair, endovascular repair, and nonoperative management.
- Inability to conform to curvature of the thoracic aorta at the location of the injury can result in malapposition of the endograft, which can lead to endoleak and endograft collapse. Excessive oversizing may result in attachment site endoleak, device infolding, endograft collapse, and even death from acute aortic occlusion.
- The safety of systemic heparinization during endovascular repair in a multiply injured patient with a closed head injury or abdominal solid organ injury is a controversial issue. In the final analysis, the decision must be individualized based on the balance of the perceived risks of bleeding in a particular organ system vs the thromboembolic complications.

Qualifying Statements

Qualifying Statements

Despite the challenges and inconsistent availability of high-quality evidence, the Society for Vascular Surgery (SVS) maintains its effort to summarize, synthesize, and present all the available evidence, along with clear clinical practice recommendations, to help surgeons and their patients in decision making. Although the SVS uses state-of-the-art approaches, such as Grading of Recommendations, Assessment, Development and Evaluation framework (GRADE), innovations are needed to improve the quality of evidence in the field and to improve the clarity and usefulness of these guidelines, which will lead to increased confidence in the advice vascular surgeons provide to their patients. Given the limited quality of the evidence, the issues with generalizability, and the importance of patient values, practice guidelines should not be regarded as definitive or prescriptive. Consistent with the tenets of evidence-based medicine, they should be used to inform clinical decision making in the context of the physician's clinical expertise and the patient's underlying values and preferences.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Safety

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

Lee WA, Matsumura JS, Mitchell RS, Farber MA, Greenberg RK, Azizzadeh A, Murad MH, Fairman RM. Endovascular repair of traumatic thoracic aortic injury: clinical practice guidelines of the Society for Vascular Surgery. J Vasc Surg. 2011 Jan;53(1):187-92. [22 references] PubMed

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2011 Jan

Guideline Developer(s)

Society for Vascular Surgery - Medical Specialty Society

Source(s) of Funding

Society for Vascular Surgery

Guideline Committee

Committee on Thoracic Aortic Disease

Composition of Group That Authored the Guideline

Committee Members: W. Anthony Lee, MD, Christine E. Lynn Heart and Vascular Institute, Boca Raton, Fla; Jon S. Matsumura, MD, Division of Vascular Surgery, University of Wisconsin, Madison, Wisc; R. Scott Mitchell, MD, Department of Cardiothoracic Surgery, Stanford University, Palo Alto, Calif; Mark A. Farber, MD, Division of Vascular Surgery, University of North Carolina, Chapel Hill, NC; Roy K. Greenberg, MD, Department of Vascular Surgery, Cleveland Clinic Foundation, Cleveland, Ohio; Ali Azizzadeh, MD, Division of Vascular Surgery, University of Texas Houston Medical School, Houston, Tex; Mohammad Hassan Murad, MD, MPH, Division of Preventive, Occupational and Aerospace Medicine, Mayo Clinic, Rochester, Minn; Ronald M. Fairman, MD, Division of Vascular Surgery, University of Pennsylvania, Philadelphia, Pa

Financial Disclosures/Conflicts of Interest

Committee members are required to provide a detailed, explicit description of their financial and intellectual conflicts of interest, consistent with the policies of the *Journal of Vascular Surgery*. Additional measures used to manage conflicts of interest include the multidisciplinary structure of

guideline committees and the involvement of a methodology group in the evidence synthesis and guidelines integration.

Dr. Lee received research support and consultation fees from Cook, Medtronic, and Bolton Medical. Dr. Matsumura has grants for research and training from Abbott, Cook, Covidien, Endologix, and W. L. Gore. Dr. Mitchell has no conflict of interest disclosures. Dr. Farber received consultant fees from W. L. Gore, Medtronic, Cook, Aptus Endosystems, and Bolton Medical. Dr. Greenberg received research support from Cook and W. L. Gore. He has IP/License agreements with Cook. Dr. Azizzadeh received consultation fees from Medtronic and W. L. Gore. Dr. Murad has no conflict of interest disclosures. Dr. Fairman received research support from Abbott, Medtronic, Cook, Aptus, and Boston Scientific.

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Electronic copies: Available from the Journal of Vascular Surgery Web site .

Availability of Companion Documents

The following are available:

- Murad MH, Rizvi AZ, Malgor R, Carey J, Alkatib AA, Erwin PJ, Lee WA, Fairman RM. Comparative effectiveness of the treatments for aortic transaction. J Vasc Surg. 2011 Jan;53:193-9.e21. Electronic copies: Available from the Journal of Vascular Surgery Web site .
- Murad MH, Montori VM, Sidawy AN, Ascher E, Meissner MH, Chaikof EL, Gloviczki P. Guideline methodology of the Society for Vascular Surgery including the experience with the GRADE framework. J Vasc Surg. 2011 May;53:1375-80. Electronic copies: Available from the Journal of Vascular Surgery Web site .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on October 17, 2014. The information was verified by the guideline developer on November 18, 2014.

Copyright Statement

Disclaimer

NGC Disclaimer

The National Guideline Clearinghouseâ„¢ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional

associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria which may be found at http://www.guideline.gov/about/inclusion-criteria.aspx.

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.